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TECHNOLOGICAL STRATEGIES OF MNCS IN INTERMEDIATE COUNTRIES: THE CASE OF SPAIN

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TECHNOLOGICAL STRATEGIES OF MNCS IN INTERMEDIATE COUNTRIES: THE CASE OF SPAIN (By Jose MOLERO, Mikel BUESA and Montserrat CASADO. COMPLUTENSE UNIVERSITY. MADRID[1])

I. INTRODUCTION.

The phenomenon of increasing technological activity internationalization is one of the most frequently discussed within the current literature of Multinational Corporations (MNCS). In fact, it is part of a more general trend of a new and growing role of subsidiary companies within the MNCS to which they belong (DUNNING, 1994; GRANSTRAND et al, 1993; PAPANASTASSIOU & PEARCE, 1993; CANTWELL, 1993). In spite of the intensity of the debate the complexity of the process makes it very difficult to understand its meaning globally. Our doubts are centred on two main aspects. First, how new is the internationalization of R&D and how extended is it nowadays and, second, what are the causes explaining this process, whatever its extent is?.

There is a relatively admitted approach which emphasizes the novelty of the phenomenon. Thus, until the 1970's MNCS had a very concentrated organization of R&D within parent firms headquarters. However, in the last twenty years we have witnessed a rapid development of R&D internationalization through the establishing of MNCS' laboratories in an increasing number of countries. Nevertheless, recent research results (CANTWELL, 1993a) have shown neither that the process is so new nor the growth of the last decades is so general.

As far as the extension of the process is concerned, after initial views which saw the internationalization of technological activity as a consolidated part of the general process of globalization (HOWELL, 1990; OECD,1992), a growing number of empirical studies offer results which allow us to put it in a more balanced context (PATEL & PAVITT, 1991a; PATEL, 1993; CANTWELL, 1993a; DUNNING, 1994). Thus, considering the existence

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of different stages on the way towards globalization, there is strong support for confirming the global exploitation of technology and only partial and less conclusive evidence in favour of the existence of global technological collaboration. The importance of global generation of technology - the last grade- is much less according to the evidence which underlines the crucial role of the national systems of innovation. (ARCHIBUGY & MICHIE, 1993).

The theoretical explanation of the process is still weak. The starting point is the analysis of the forces which press for keeping the production of technology centralized and other ones pushing it into a more decentralized and international framework (GRANSTRAND et al 1993). The first group includes the following: a) the companies' need to protect firm-specific technologies; b) the existence of significant scale economies in R&D and the difficulties of reaching "critical mass" in decentralized laboratories; c) the role played by home market conditions in creating and maintaining firm specific technological advantages and d) the wish to minimize coordination and control costs.

On the other side of the balance there are also reasons for decentralizing the technology-creation mechanism (CANTWELL & HODSON, 1991; PEARCE & SIGHT, 1991). DUNNING (1994) has summarized them in four types: i) product, material or process adaptations or improvements, which include a very important process of evolving from technical support activities into proper development projects (GRANSTRAND et al, 1993); ii) basic material or product research, usually undertaken for two reasons: the immobility of such a kind of resources and the need for continual testing and interaction with customers; iii) research for rationalizing or cost minimizing productions and iv) to acquire or gain an insight into foreign innovating activities. This last point basically affects to R&D extension to countries belonging to the "Triade" (PATEL, 1993, DUNNING, 1994).

From another point of view, the literature highlights the existence of task division among parent companies and affiliated companies (PEARCE & SIGHT, 1991; PEARCE & SATWINDER, 1992; HÄKANSON, 1991; VON BOEHMER 1991; MOLERO & BUESA, 1993). Thus,

basic research is almost exclusively done in parent company laboratories; applied research for obtaining new product and processes is shared many times, although there is a clear imbalance in favour of headquarters' installations. Finally, the activities related to the improvement or adaptation of products and processes are also shared between central and subsidiary firms, albeit with an increasing presence of the latter.

A previous work (MOLERO & BUESA,1993), dealt with the technological component of MNC strategies operating in Spain. Within a framework made up from the new theory of technological change (DOSI ET AL, 1988; FREEMAN, 1990) and new developments of technological competition of MNCS (CANTWELL,1988; CHESNAIS, 1991), we studied the behaviour of German industrial subsidiaries (GS) operating in Spain throughout the period of its integration in the EEC.

The main results can be summarized in two points. First, GS have a significant technological activity in Spain which obliges us to avoid any identification of the Spanish case with others the literature relates to less developed countries (LDCS). This activity in turn has two features which are worthy of comment. On the one hand, it is higher than what can be seen in current Spanish firms; this result contradicts other findings available for more advanced countries (DUNNING, 1994). On the other hand, it is lower than technological tasks carried on by other GS in more developed markets (WORTMAN, 1991). Thus the denomination of "Intermediate case" seems to be very adequate for describing the Spanish position. Nevertheless, the globalization thesis is of little help, at least in its most extreme form.

Additionally, the fact was highlighted that there is a great variety of behaviours. So, after a complex taxonomy effort, a map was drawn including cases from "Passive adaptation" to "Partial Technology Autonomy" types of subsidiaries. However we did not find any example of Spanish subsidiaries entering into high level research activity[2]

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[2] In fact, from 20 German parent companies which answered our questionnaires, no one said their Spanish subsidiary did basic or advanced research.

The aim of this paper is to improve our knowledge about the weight MNCS have in the Spanish Innovation System and the strategies they pursue. Besides this, there is the intention of contributing to the open debate about MNCS' role in the international creation and diffusion of technology.

For these purposes we have new evidence coming from newly available statistics and later pieces of research completed in recent months. The first one deals with Dutch subsidiaries (DS) established in Spain. Here we have followed the same methodology used for GS investigation. The comparison of the two cases will allow us to know whether GS were special cases or not.

In spite of the accumulation of recent research, there is still scarce evidence on the influence of MNCS international activity upon the host economies (CANTWELL,1993a; DUNNING, 1994). The second work is a contribution to this debate. It refers to technological regimes (ORSENIGO, 1989; MALERBA & ORSENIGO,1991) followed by MNCS doing technological innovation in Spain in relation to Spanish innovative firms[3]. The similarities and differences which can be found, will highlight their influence on the Spanish Innovation System.

II. GENERAL CONSIDERATIONS ABOUT TECHNOLOGICAL ACTIVITIES OF MNCS IN SPAIN.

Before entering the core of the discussion, it is useful to draw a brief contextual panorama concerning MNCS' activity from a historical perspective.

We can consider three stages in recent times. The first goes from the 1950's until 1974/5 and is characterized by having one of the highest rates of growth of the OECD. The second can be defined as a transition period and lasts until the mid-eighties, when Spain entered the EEC. The last one is still alive and represents the end of the opening up process of our economy.

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[3] It comes from full research carried out about innovative firms in the Madrid region the main results of which have been published in BUESA & MOLERO, 1992.

During the first stage the MNCS' technological activity was fundamentally the importation of multiple production and organization technologies for exploiting their firm's advantages and two basic local factors[4]; first, the possibilities of a rather large and growing market very closed to foreign trade. Secondly, the availability of a cheap labour force hitherto accumulated in an extremely backward agriculture.

Thus technology transfer was very active both through embodied (capital good importation, direct investment) and disembodied forms (licences, technical assistance). As in others' experiences, this had a positive balance if we look at its incidence on Spanish productive firms and different negative consequences if we consider direct and indirect costs (payments, abusive clauses, etc). About the activity developed in Spain, they carried out very little research, so the repercussion on the Spanish research system was poor[5].

In the transition stage, the international transformations we witnessed had a peculiar development in Spain as a consequence of its integration into the EEC.

With regard to technological development, there was an increasing awareness of our important international backwardness. It led to the first serious political actions in this field, such as the creation of the Centro Para el Desarrollo Tecnologico e Industrial (CDTI) in 1977.

In this context, MNCS' activity underwent significant changes. After a short period of FDI stagnation -due to the instability of the political transition- , foreign investments continued growing at a very rapid rate. Of course it was due, principally, to MNCS' renewed action. To explain it we need to consider a twofold argument. On the one hand, the profound need Spain had to reorganize its economy to compete better in the new international economy. It made many existing firms seek outside collaboration. On the other hand, the interest of many MNCS in

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[4] Among others the following works can be consulted: MUÑOZ, ROLDAN & SERRANO, 1978; BUESA & MOLERO,1988.

[5] This was dealt with in MOLERO,1983.

reinforcing (or starting) their presence before Spanish entry into the EEC.

From a strategic point of view, one must underline the shift of many MNCS to a more active exporting role. It demanded significant changes in laws regarding their relationships with local firms and new decisions about technological activities developed in Spain. In fact, in the mid-1980's MNCS had a crucial weight in most technological indicators such as R&D, external payments or the introduction of innovations(MOLERO, 1992).

We arrive at the present phase in which the integration of the Spanish economy to the international economy is very progressive. As in most cases, it assumed a liberal orientation of the economic policy which, among other things, implied a strong accent on the role played by foreign investments in restructuring our productive system. Moreover in these years, we witnessed very dynamic changes of the internationalization process; one of the most outstanding being the new international distribution of MNCS technological activities (CASSON, 1991, CANTWELL, 1993).

It is in this complex and changing scenario that we have to place our analysis of MNCS' technological strategy in Spain.

III. BEHAVIOUR AND TECHNOLOGICAL STRATEGIES OF MNCS IN THE SPANISH ECONOMY.

In order to understand correctly the technological activity of MNCS operating in Spain, we need to have an approach to the importance they have in the Spanish Innovation System. We also should know the extent to which they participate in the international division of technical change.

Regarding the first point, we have summarized in table nº1 the basic data coming from official Spanish R&D statistics. There you can see the very central position MNCS have within our R&D system. They carry out more than 40% of total entrepreneurial activity and -more important- they contribute with more than 53% of total firms' resources[6].

[6] In these estimates we have put together firms with a majority of foreign capital and those "controlled" by foreign capital, which means adding a group of firms with foreign

[Table 1 around here]

The same source allows us to add two qualitative complements. First, the share of MNCS in Spanish official aids to support R&D is very reduced, contrasted wiht their R&D activity. In fact they receive about 11% of public administration funds. Consequently, the origin of MNCS' R&D financial resources has a distinct composition from that corresponding to Spanish firms. While the her group contributes about 70% of the resources they manage, and receive around 20% from the administration, foreign firms' self-financing goes up to more than 90% and they only receive marginal help from the Spanish administration (INE, 1993).

From the output point of view, all available evidence confirms the higher performance of the MNCS subsidiaries in comparison to the Spanish firms (MOLERO, 1992). Interestingly the stricter is the concept the higher is the position of MNCS in relation to Spanish firms.

Although there are no statistics of R&D internationalization, several studies have tried to produce some basic data (WARRANT, 1991; CANTWELL, 1991). Unfortunately the number of experiences developed in Spain make it included in groups like "other countries" or "rest of Europe". One of the few exceptions is the study by WARRANT (1991) which takes information from the leading industrial groups of most developed countries. About the Spanish position, two facts summarize it. On the one hand, there is no significant Spanish firm's laboratory outside Spain. On the other hand, the number of R&D centres other MNCS have established in Spain is very limited, less than 2% of the total.

The next step is to analyze the strategy followed by MNCS in Spain. Although the samples of firms we are going to use only refer to German and Dutch subsidiaries, we think they can cast light on the general situation because both Germany and Netherlands have been very active countries in FDI in Spain in recent years (MOLERO & BUESA,1993; BUESA & MOLERO,1993).

The starting point in our research was to know the origin of the products those companies commercialize. An initial approach gives

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investment between 20% and 50% of their share capital.

the impression there is a difference between DS and GS behaviour because while 70% of DS claims to develop partially or totally their products in Spain, only 40% of GS answer in the same way. Nonetheless, an in-depth analysis leads us to the conclusion that, regardless of the number of participants, most are in a minority position and only about 20% share a significant part of the total[7].

This position of Spanish subsidiaries has its reflection in the origin of their production technologies. In fact, as Table nº 2 shows, the parent companies are the main suppliers of product technology. As far as process technology is concerned, the position is more balanced between parent companies and subsidiaries. That close technological relationship is not extended to firms outside the group. It is especially true with regard to other Spanish firms and a little more pronounced in the case of DS. Both distributions show a similar general pattern of technological acquisition.

[Table 2 around here]

There is a majority of Spanish subsidiaries which do not develop R&D programmes. Nonetheless, as Table 3 shows, the number of firms with this sort of task is not negligible: in both cases it is close to 44% of the corresponding samples.

[Table 3 around here]

The financial effort of most of them is established between 0.5% and 2% of sales volume. Only in about 20% of the cases do the resources devoted to R&D exceed 2% of the sales. The estimated average level of effort is 1.86% of sales volume for GS and a little lower for DS: 1.5%. In both cases, it is clearly superior to the average behaviour of local firms (BUESA & MOLERO, 1993; MOLERO & BUESA, 1993). However we do not see a parallel higher level of resources as far as personnel is concerned; in fact, the relative research teams have a position similar to the Spanish companies. Combining the two elements we arrive at the conclusion that MNCS' subsidiaries usually make more intensive research

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[7] In DS, 4.3% of the firms declare an exclusive participation and other 17.4 % participate with more than 50%. The figures are similar in GS: 6.6% and 17.% respectively.

effort compared with Spanish firms.

In cases for which there are available comparative data, we have proved that effort is significantly lower than that of other subsidiaries in most advanced counties (WORTMAN, 1991). This is one of those results which enables us to reach the conclusion about the intermediate character of the Spanish position in the recent international division of technology creation.

About R&D objectives, both studies show a very similar pattern followed by DS and GS[8]; the highest emphasis is put on product development and improvement while other tasks related to process technologies or imported technology adaptation occupy secondary positions.

The last group of questions we have explored deals with some technological results of the firms. We have used two indicators: one about the rate followed for innovation introduction and the other related to technology exports.

The "effective innovation introduction" refers to new products and processes incorporated by the firms. The way to approach the importance of such changes is through the weight those shifts have on the final output of the company.

Table nº 4 summarizes the results obtained for GS and DS, together with others coming from similar studies carried out for other Spanish groups.

[Table 4 around here]

As can be seen, both GS and DS are quite active in introducing products and processes. DS are even more dynamic, which puts them in a very different position among all studied cases.

From a general point of view, two features summarize the behaviour of our two samples. First, they confirm the greater technological activity of MNCS in comparison to large Spanish firms. Secondly, DS and GS behave very similarly to most active Spanish companies.

One must be cautious in drawing conclusions. In fact we think a twofold interpretation can be proposed. On the one hand, those

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[8] This is confirmed through an X^2 test between the two distributions; it reaches a value of 0.4634 and is not different from zero at 95% of confidence; See BUESA, MOLERO,1993.

results confirm the crucial role of MNCS in the current technological pattern. On the other hand, one must emphasise that the consequences for the Spanish system of innovation are different, depending on the way in which innovations are produced. If the Spanish subsidiary only plays a passive role in incorporating product or process innovations, the faster dynamism they present can have a much lower impact on our technological capabilities than the one derived from a local activity even though it is slower.

In spite of the basic similarities we have commented on, there are some by no means negligible differences between both collectives regarding their degree of innovativeness. This could be difficult to understand after knowing the similarities about technological resources. Nonetheless, although available data are not enough to make a final interpretations of these differences, We think they confirm the non-linear character of innovation. Therefore we suggest three arguments to explain the differences we have pointed out.

1) The sectoral distribution of the firms which directly affects technological opportunities and their degree of appropriability.

2) The technological strategies adopted by firms that may belong to the same sector[9].

3) The propensity to import. Because through imports some products or processes not available from inside the firm can be incorporated.

The second results indicator deals with technology exportation. In both samples data show a marginal role of this activity in DS and GS. Less than 10% in both cases claim to export some technological inputs or services.

In explaining that behaviour we cannot use the argument of the low technological level of the firms, as can be the case for most national companies (BUESA & MOLERO, 1992; SANCHEZ & VICENS 1991). Rather we have to consider the link with the parent company and

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[9] In a previous work (MOLERO & BUESA, 1993) this aspect was confirmed for German subsidiaries. However there are no similar observations for Dutch companies.

the role it assigns to Spanish affiliated companies. However, there are some results of GS to lead us to assert sometimes that their technological level is inferior compared to other firms of the same international group (MOLERO & BUESA, 1993). Moreover, the little exporting they do mostly consists of technical assistance, usually admitted as of lower level than licences or patents.

To finish this section we want to make some comments on the typology we made for delving deeper into the GS variety. It was possible because we had regular information from a substantial number of parent companies which not only complemented information coming from our questionnaires and interviews, but also help us in qualifying the answers of the subsidiaries (MOLERO & BUESA, 1993).

We took into account the following set of data:

First, the degree of internationalization of subsidiary production. We approached it through the company participation in the production of the group, complemented by considerations on the technolcgical level of the company and the origin of the technology they use; see lines 1 to 4 of table nº 5.

[Table 5 around here]

Secondly, we used data on the company dynamism in incorporating new products and processes. As table nº 5 shows (see line 5), there is a sort of inverse relationship between the speed of innovation incorporation and the technological effort made by the subsidiary.

The third element refers to market positions, either domestic markets or exports (see lines 6 and 7 of Table 5). The outstanding relation arises between the rate of new incorporations and domestic market positions. The higher the first, the lower is the second.

Adding other complementary information, we reach a taxonomy in which three basic traits can be outlined.

One is the very particular case of subsidiaries having a Partial Technology Autonomy; any attempt at analysisng them as homogeneous totality is condemned to misunderstand their complex position.

A second basic trait is reflected in the Passive Adaptation type. They operate on the basis of an external flow which allows them to incorporate innovation rapidly. Nevertheless, the technological level and effort are low. Thus, in spite of the possibility of new incorporations, their market positions are modest in comparison to that of other subsidiaries.
Finally, the greater the technological effort and level, the higher is the participation in group activities and the stronger are the market shares.

IV. MNCS' TECHNOLOGICAL REGIMES AND DOMESTIC CONSEQUENCES.

Having studied the basic features of their strategies, we are now going to analyze MNCS activity from the point of view of the internal organization of technology creation. It is a more qualitative approach based on the notion of "technological regime". This concept refers to a specific combination of particular knowledge bases, sources and degrees of technological opportunities, conditions of appropriability, and forms and degrees of technological advances" (ORSENIGO, 1989).
The empirical source is a research into Madrid innovative firms, carried out in 1992 (BUESA & MOLERO, 1992). It dealt with 151 companies having different external signs of making technical innovation[10]. There are 27 of those firms whose control is in foreign hands; the rest are controlled by national persons or groups. So, we have made a systematic comparison between the two groups in order to establish whether they behave within the same pattern in relation to the following topics.

Sectoral distribution and size
Export orientation
Ways and means of acquiring technological inputs from other sources
Ways of creating own technological resources
Product and process innovation incorporation

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[10].Among them, three very fundamental ones were: to do R&D programmes; to patent and to be included in some of the administration programmes for supporting firm's innovations. For more details see BUESA & MOLERO,1992.

Technological level in relation to national or foreign competitors
Technology transfer to other firms
Forms of protecting technological knowledge
R&D activity, including intensity, types and organization

Before presenting the outstanding findings we want to highlight two general characteristics of them. First, the number of foreign firms is not enough to make a sectoral analysis. If sectorial distributions of national and foreign samples are not similar[11], it is possible that some of the differences to be shown respond to distinct sectorial implantation.

On the other hand, in most aspects the corresponding behaviour presents a great similarity; thus, the contrasts we can establish are based on qualitative shades of a relatively similar pattern. We ought to keep in mind that the two samples are subgroups of a common population formed with firms whose basic characteristic is to be innovative agents[12].

There are two other structural features which can influence global conduct. One is the size of the firms which shows a systematic advantage for foreign firms in comparison with the Spanish ones: in her group, firms of over 200 workers represent 32.8% of the total, while in the former it reaches 48.1%. On the contrary, small firms -below 50 employees- are 46.8% of the Spanish group and only 18.5% of the multinational one.

The second is the degree of external opening up. In the Spanish group, nearly one third (33.1%) do not export anything, while it falls to 11.1% in the foreign group. Firms with high propensity to export (exports to be more than 25% of sales) are more frequent within multinational subsidiaries -37%- than in Spanish

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[11] The X^2 test reaches a value of 15.0603 and, below its significant ratio at 90% of confidence. However, it does not allow us to accept the independence of the samples with 95% confidence.

[12] It is important because there is a great deal of evidence showing foreign firms are substantially different from Spanish-owned ones if we consider all sorts of firms. See, among others, BUESA & MOLERO,1988 and DURAN, 1990.

companies -16.9%-[13].

Therefore, foreign firms are usually larger and export more and their presence is more frequent in branches such as Pharmacy, Transport Material, Metallurgy and Chemicals.

Going into technological aspects, Table nº 6 shows subsidiaries have higher dependency on external sources for their technological development, above all as far as product technology is concerned. It is reflected in two different data: the lower number of exclusive own developments and the lower proportion of joint developments in which local firms have a predominant position over outside collaborators. The combination of both elements is included in the global autonomy index.

[Table 6 around here]

Tables 7 and 8 link the results of the sources and instruments the firms use in acquiring those technological inputs they do not produce by themselves.

Regarding the sources, the expected difference is the higher importance of group's firms in providing technology for MNCS' subsidiaries. Spanish firms are usually much less integrated in international or national groups, so this source has a quite minor significance.

On the contrary, MNCS subsidiaries work less frequently with Spanish engineering firms and other international companies operating in the same branch. As was highlighted in the previous section, it confirms the closed strategy follow by MNCS' in Spain and their scant collaboration outside the group.

[Table 7 around here]

The analysis of the instruments through which the external technology is incorporated, brings us a picture of MNCS where the most interesting fact consists of a lower utilization of computer services (whether coming from Spanish and foreign firms), together with a higher utilization of disembodied technologies in the form of patents and technical assistance. In agreement with other studies, the pattern of the Spanish firms' purchase of technology confers much higher importance on mechanisms which

[13] For these two questions X^2 values allow us to accept the independence of both distributions with 95% confidence.

embody technical knowledge, particularly capital goods acquisitions (MOLERO & BUESA, 1992).

[Table 8 around here]

Regarding the ways for companies to create their own technology, no noticeable difference is observed between the two groups. In both cases R&D and firm's experience occupy the first two places while design and production engineering are in second place, even though there is a slightly higher R&D activity in foreign subsidiaries. Much less importance have different forms of external collaborations either with private firms or with public institutions.

Afterward an in-depth study was made of several features of R&D organization to seek possible qualitative differences. No significant one was found related to aspects such as type of R&D (basic, applied, technical development, etc) or the external institutions with which the firms collaborate[14].

The main difference arises on asking about the period in which firms started to research. In fact, the average length of time doing R&D is higher in MNCS subsidiaries which, in turn, is related to an earlier moment of the firm's establishment or the firm's control.

Going into the analysis of some results indicators, Table nº 9 summarizes the available data on innovation introduction. The firms gave the percentage of sales corresponding either to products introduced in the last five years or to products manufactured with processes established in the same period.

From previous works (BUESA & MOLERO, 1992) we knew there are important differences between firms regarding their domestic or external basic orientation. Therefore, we introduced questions for measuring separately the weight of the innovation in relation to domestic sales and exportation.

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[14] There is no contradiction between this assertion and the previous one when we said foreign subsidiaries collaborate less than Spanish firms. First of all, in the former section the question was about any external collaboration, not just R&D. Secondly, here it is said that, whatever the intensity of the collaboration is, the way they follow for its implementation is very similar. However I might mention a slightly higher R&D collaboration of subsidiaries with other group's firms.

[Table 9 around here]

As in other parts, the results do not distinguish perfectly between the two clusters. Nonetheless, there seems to be a slight trend of MNCS to be less active in renewing their production than innovative Spanish firms. The only probable exception has to do with international markets where Spanish branches of MNCS have a more rapid renewal of their products.

This finding can be affected by differences in sectorial allocation of the firms, even though we can not give its verification. Moreover, information from German subsidiaries, allows us to suggest that the higher external orientation of the multinational group is a result of being part of an international organization which, among other advantages, provides more internationally competitive products. The last argument can be additionally supported with other information of the research, which shows how foreign owned firms claim to have a better technological position compared to international competitors.

From the receiver economy it is of great interest to know whether the technology of the subsidiaries is widely spread among other local firms. The results of Table nº 10 suggest the conclusion that MNCS' subsidiaries have a lower activity of technology transfer than innovative Spanish companies. Noteworthy is the scarce flow of technology to other Spanish firms, whatever the means of transfer we look at. In our opinion it confirms once again the relative isolation of MNCS' subsidiaries, which implies probably that diffusion effects are not proportional to the technological strength of those firms.

[Table 10 around here]

The last group of factors have to do with the appropriability and control of technological capabilities. Where their strategy is concerned regarding industrial property there is a slightly higher activity of foreign firms, particularly as far as international rights are concerned. That group has a double probability of patenting[15] in Europe and USA, compared to Spanish companies. The latter only present a very slightly higher

[15] Defined as the percentage of firms with patents.

probability of patenting in Spanish territory.

The former difference does not correspond to a less regular acquisition of technical knowledge because, in fact, Spanish innovative firms claim to have a similar regularity in obtaining that sort of knowledge[16]. Thus the explanation seems to lie in different possibilities and entrepreneurial strategies; MNCS have more resources and a longer experience in using legal methods to protect their technology, regardless of their capabilities.

Finally, we asked the firms to evaluate the importance of different methods of appropriating technical knowledge. As Table nº 11 shows we found the multinational group considers of greater importance patents and industrial secrets, in spite of both groups valuing regularity in innovation as the fundamental way to protect themselves from imitators.

[Table 11 around here]

V. CONCLUSIONS.

Intermediate countries have particular characteristics which make the more extended theory not totally suitable to explain their role within the international pattern of technology creation and diffusion. Similarly, the strategies adopted by MNCS in these nations can differ substantially from the ones they are establishing in leading and less developed countries. We think Spain is a very appropriate example to study.

The evidence we have discussed is not enough to close a debate which is relatively new. Therefore we need to accumulate more empirical research and to debate critically their results and theoretical background if we truly want to know what our reality is.

Nevertheless, it is possible to establish some provisional conclusions in relation to economic analysis as well as to economic policy.

About analytical work, the first idea we should like to underline is that the intermediate situation is confirmed. Moreover the existence of "intermediate" cases implicitly confirms the uneven

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[16] 92,7% of the Spanish sample usually obtain regular new technical knowledge. In the foreign group the level is very similar, 85,2%.

character of the internationalization of technological knowledge. In other words, the "globalization" thesis has to be used very carefully when considering countries not belonging to the core of the "world triad" (PATEL, 1993; DUNNING, 1994).

The second point concerns the need for a better knowledge of MNCS' activities as a requisite to evaluate correctly their contribution to the domestic system of innovation. Two central aspects arise for future investigations; the position occupied in relation to local firms and the relationships regarding environmental institutions.

A significant qualitative element in this respect is the length of time they have been operating in the country. The longer their stay is the better they appreciate the possibilities and limits of national firms and institution (GRANSTRAND et al, 1993). To some extent, the similarity described between MNCS' subsidiaries and Spanish innovative firms show the adaptation of the former to local conditions. In further researches a way of advancing in this question is through case studies in a time perspective.

Finally we think most previous aspects can be incorporated to a methodology based on taxonomies as an intermediate possibility between general traditional models and empiricist positions. Regarding the first, it is important to overcome their lack of realism and the absence of valid political recommendations. The exaggerated empiricism is a kind of never-ending process of getting jobs for economists accumulating more and more data but obtaining only contradictory conclusions among different parameter estimations.

Remembering the two taxomonies used, the first -types of subsidiary- has been confirmed because the Dutch sample responded basically to the same patterns that the German ones did. Here one crucial question arises; if there are important differences in the international trajectory of German and Dutch MNCS (PATEL & PAVITT, 1991), how can we explain their similar behaviour within the Spanish economy?. In our opinion, it is a consequence of the lesser importance of the technological activity they develop in Spain. On the other hand, we have found a lot of similarities between our classification and other ones used in recent studies

(CASSON, 1991; PAPANASTASSIOU & PEARCE, 1993; TAGGART, 1993)

As far as Technological Regimes are concerned, there are some interesting differences we have underlined. However, it is very important to compare the behaviour of MNCS subsidiaries with the basic Regimes we identified (BUESA & MOLERO, 1992, 1993a). In doing so, we arrive at the conclusion that foreign group do not follow systematically any of those Regimes. In other words, although they present some peculiarities, they do not belong to a single group within the general collective, confirming their integration into the Spanish institutional framework.

Regarding political measures, the central idea is the necessity of modifying the classical set of instruments in promoting MNCS presence in this kind of country if we wish to get a better impact of their local activity (CANTWELL, 1993a; DUNNING,1994). If in previous times, Spain and some other intermediate nations could base their attraction on some lower cost or protected markets, today they must be aware of the new factors MNCS are looking for.

Particularly if you seek the technologically dynamic part of MNCS, you have to have other stimuli different from public aids or low wages. One has to improve the R&D system, the educational organization (e.g universities and professional training), infrastructures, etc. This way you will receive more foreign investment producing higher spillovers and stronger integration with the national economy.

In the same direction and in spite of its difficulty (HÄKANSON & NOBEL, 1993; PAPANASTASSIOU &PEARCE, 1993; DUNNING, 1994), it is not possible to design Technological Policies which ignore the central part MNCS subsidiaries play in National Systems. Without forgetting national interests, today it is possible to think of a more active role of foreign subsidiaries in many national technological goals.

Countries like Spain offer some advantages for locating intermediate activities such as some applied research and technological developments. However, these advantages are limited by their deficiencies in technological infrastructures and skills. Moreover, other countries not very far from their level

of development can compete with them if they make an effort in R&D resources. So the challenge is to act in another direction, by occupying a higher intermediate place on the basis of a superior technological development for which a better integration of MNCS is needed.

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Table 1 Sharing of firms, clasified on their level of foreign penetration and different indicators of R & D

Types of firms conform their grade of participation of foreign capital	Sharing in total R & D expenditures of firms	Sharing in the funds proceeding from the public administration	Sharing in the contribution in R & D of funds of bussiness enterprises
Without foreign capital	45.21	75.71	43.22
Foreign participation < 20%	11.83	13.27	3.48
Foreign participation 20% < 50%	4.22	4.21	4.67
Foreign participation > 50%	38.73	6.81	48.62
TOTAL	100.0	100.0	100.0

Source: Elaborated by the authors with dates of the INE (1993)

Table 2 Origin of the technology used by MNCS' subsidiaries in Spain (% of total[a])

	Product technology		Process Technology	
	German Firms	Dutch Firms	German Firms	Dutch Firms
Developed by subsidiary in Spain	46.9	30.4	54.0	43.5
Acquired from other Spanish companies	6.2	0.0	3.5	0.0
Imported from parent company	68.1	73.9	60.2	52.2
Imported from other foreign company	10.6	4.3	12.5	4.3
Data not available	2.7	0.0	4.4	0.0

[a]: They are not exclusive percentages, so vertical additions do not equal 100

Source: Molero & Buesa, 1993 and own elaboration

Table 3 R & D Activity of MNCS' subsidiaries in Spain (% of total[a])

	German firms	Dutch firms
A) Companies carrying out R & D programmes	44.2	43.5
B) Distribution of companies carrying out R & D programmes on the basis of turnover allotted to its financing (total=100)		
Less than 0.5% of sales	12.0	20.0
Between 0.5% and 2% of sales	62.0	60.0
Between 2% and 5% of sales	22.0	20.0
More than 5% of sales	4.0	0.0

[a]: They are not exclusive percentages, so vertical additions do not equal 100

Source: Molero & Buesa, 1993 and own elaboration

Table 4 Innovations introduction of different groups of firms with residence in Spain (Percentages)

Groups of firms	product innovation a	b	c	d	Process innovation a	b	c	d
Dutch firms (23)	91.3	56.4	60.4	60.4	73.9	47.8	60.7	60.7
German Firms (113)	82.3	20.4	30.2	34.8	78.8	17.7	27.6	32.9
Large Spanish firms (439)	44.4	16.9	21.7	37.5	30.1	na	na	na
- Multinationals (136)	61.8	27.6	30.3	41.5	38.3	na	na	na
- Public Enterprises (57)	33.3	12.3	17.3	37.4	24.6	na	na	na
- Spanish private enterprises (246)	37.4	12.2	17.3	34.0	26.8	na	na	na
Innovative firms of Madrid	91.4	50.7	53.4	55.7	63.6	36.4	52.2	56.0
Firms of the Bask Country (484)	36.3	na	na	na	19.0	na	na	na

Sources: Own elaboration with data of our own questionnaires (dutch firms); Molero y Buesa (1993) (german firms); Circulo de Empresarios (Large Spanish Firms); Buesa & Molero (1992) (Innovative firms of Madrid) and IKEI (1990) Firms of the Bask Country.

A: Firms that have introduced some product (process) in the last 5 years

B: Firms for which the new products (processes) are involved in more than 50% of the sales.

C: Estimation of the sales of new products (or products produced by new processes) in relation with the sales of the total group of firms (excluded firms of which the dates are not available)

D: Estimation of the sales of new products (or products produced by new processes) in relation to the the sales of the innovative firms of each group of firms

** Data of each group of firms are not strictly comparable with the rest because they refer to the firms who are considering their products are innovative or that are using innovative processes on a significant way

** The numbers in parenthesis are the numer of the firms of each group of firms

TABLE 5 TAXONOMY OF SUBSIDIARIES' TECHNOLOGICAL BEHAVIOUR

	TYPE OF SUBSIDIARY				
	PASSIVE ADAPTATION (PA)	ACTIVE ADAPTATION (AA)	TECHNOLOGICAL COLLABORATION (TC)	PARTIAL TECHNOLOGY AUTONOMY (PTA) A	B
Technological level plant	Low	Average	High	Average	High
Source of technology	Parent	Mixed	Mixed	Parent	Own
R & D	No	Poor	Average	No	High
Share group production	Low	Average	Average	Low	Very high
Rate of novelties incorporation	High	Average	Low	Low	Very high
Local market position	Low	Average	High	Average	High
Exporting propensity	Average	Average	Low	Average	High
Model sector	Automobile Auxiliary	Vehicle Engines	Electrical material Metal Products	Particular Cases	

A: Characteristics corresponding to the company as a whole.
B: Characteristics corresponding to the product(s) of exclusive responsability
Source: Own elaboration

TABLE 6 ORIGIN OF THE TECHNOLOGY USED BY FIRMS (IN %)

	NATIONAL CONTROL		FOREIGN CONTROL		TOTAL	
ORIGIN	TECHNOLOGY OF PRODUCT	PROCESS	TECHNOLOGY OF PRODUCT	PROCESS	TECHNOLOGY OF PRODUCT	PROCESS
Not available	4.8	26.2	11.1	11.1	6.0	23.8
OD. Own development	53.2	37.9	37.9	44.4	50.3	39.1
EA. External acquisition	4.8	4.0	3.7	7.4	4.6	4.6
Both:						
OD > EA	24.2	15.3	18.5	14.8	23.2	15.2
OD = EA	6.5	10.5	3.7	3.7	6.0	9.3
OD < EA	6.5	5.6	25.9	18.5	9.9	7.9
ITA: Indicator						
Technological Autonomy	80.1	76.4	66.7	69.8	77.8	75.0

Source: Own elaboration
The Indicator of Technological Autonomy (ITA) is constructed with data of the firms for which the information is available. The values come from the following formula: ITA = OD + 0.75(OD>EA) + 0.50(OD=EA) + 0.25(OD<EA)
The values will rang between 100 (Maximum Autonomy) and 0 (Absolute dependency)

TABLE 7 MODALITIES OF ACQUISITION OF EXTERNAL TECHNOLOGY

	NATIONAL CONTROL				FOREIGN CONTROL				TOTAL			
	Spanish Agents		Foreign Agents		Spanish Agents		Foreign Agents		Spanish Agents		Foreign Agents	
TECHNOLOGY ACQUISITED	Firm	IE	Firm	IE	Firm	IE	Firm	IE	Firm	IE	Firm	IA
Clients or users	12.9	0.18	8.1	0.11	14.8	0.15	14.8	0.07	13.2	0.17	9.3	0.11
Suppliers of equipment	16.9	0.18	22.6	0.26	14.8	0.22	25.9	0.30	16.6	0.19	23.2	0.27
Other suppliers	4.0	0.02	7.3	0.06	11.1	0.11	18.5	0.00	5.3	0.04	9.3	0.05
Engineering firms	9.7	0.10	15.3	0.17	11.1	0.04	18.5	0.18	9.9	0.08	15.9	0.17
Other firms of the groups	7.3	0.11	6.5	0.08	14.8	0.22	55.6	0.96	8.6	0.13	15.2	0.24
Other firms of the sector	4.8	0.02	13.7	0.19	7.4	0.04	18.5	0.07	5.3	0.03	14.6	0.17

Source: Own elaboration
Firm: % of firms that are using this kind of modality
IE : Indicator of Evaluation elaborated by the following formula:
IA = (FP/100) * (1+VI-NVI)
In which VI refers to the firms who are considering as Very Important the corresponding modality and NVI refers to the firms that are considering it as Not Very Important. So VI and NVI are expressing in decimals about the total of firms that are using each modality. The value will variate between a maximum of 2 (When all the firms are using a modality and appreciating it like very important) and a minimum of 0 (When none of de firms are using a modality or if they are using it but all the firms are appreciating it as not very important)

TABLE 8 INSTRUMENTS USED BY THE TECHNOLOGY ACQUISITION FROM OTHER FIRMS

	NATIONAL CONTROL				FOREIGN CONTROL				TOTAL			
	Spanish Agents		Foreign Agents		Spanish Agents		Foreign Agents		Spanish Agents		Foreign Agents	
INSTRUMENTS	Firm	IE	Firm	IE	Firm	IE	Firm	IE	Firm	IE	Firm	IE
Patent license	1.6	0.00	14.5	0.19	7.4	0.07	37.0	0.44	2.6	0.01	18.5	0.24
License for other elements of industrial ownership	0.8	0.00	12.1	0.13	3.7	0.07	14.8	0.15	1.3	0.01	12.6	0.13
Technical assistance	6.5	0.05	13.7	0.11	7.4	0.15	18.5	0.22	6.6	0.07	14.6	0.13
Key turn plants	7.3	0.07	6.5	0.07	3.7	0.04	3.7	0.00	6.6	0.06	6.0	0.05
Capital goods	18.5	0.22	24.2	0.27	14.8	0.11	22.2	0.30	17.9	0.20	23.8	0.27
Software	12.1	0.14	23.4	0.27	3.7	0.07	11.1	0.11	10.6	0.13	21.2	0.24
Others	0.0	0.00	2.4	0.03	3.7	0.04	3.7	0.04	0.7	0.01	2.6	0.03

Source: Own elaboration
Firm: % of firms that are using the indicated type of instrument
IE: like in table 7

TABLE 9 EFFECTIVE INTRODUCTION OF INNOVATIONS IN THE LAST 5 YEARS

INTRODUCTION OF INNOVATIONS (% of the sales)	NATIONAL CONTROL				FOREIGN CONTROL				TOTAL			
	Product Innovation		Process Innovation		Product Innovation		Process Innovation		Product Innovation		Process Innovation	
	IM	EX	IM	EX	IM	EX	IM	EX	IM	EX	IM	EX
None (0%)	4.0	12.1	4.8	8.9	3.7	11.1	3.7	7.4	4.0	11.9	4.6	8.6
Less than 25%	22.6	17.7	10.5	8.9	29.6	25.9	22.2	18.5	23.8	19.2	12.6	10.6
Between 25% and 50%	18.5	8.9	13.7	7.3	25.9	7.4	18.5	3.7	19.9	8.6	14.6	6.6
Between 51% and 75%	14.5	8.1	11.3	5.6	18.5	7.4	14.8	7.4	15.2	7.9	11.9	6.6
More than 75%	35.5	25.8	26.6	17.7	18.5	29.6	14.8	25.9	32.5	26.5	24.5	19.2
Not available	4.8	27.4	33.1	51.6	3.7	18.5	25.9	37.0	4.6	25.8	31.8	49.0
Innovative density[a]	52.5	46.7	56.6	48.3	38.5	45.5	40.0	52.9	50.0	46.4	53.4	49.3

Source: Own elaboration
IM: Internal Market
EX: Export
[a] % of the firms that are realizing more than 50% of their sales in the internal market or of their exports with new product or products ellaborated with new processes, counted on the total of the firms from which data are available.

TABLE 10 FORMS OF TRANSFER OF TECHNOLOGY TO OTHER FIRMS
(Percentage about the firms that are transferring technology)

FORMS OF TRANSFER OF TECHNOLOGY	NATIONAL CONTROL		FOREIGN CONTROL		TOTAL	
	SF	FF	SF	FF	SF	FF
Patent license	5.6	7.3	0.0	14.8	4.6	8.6
License for other elements of industrial ownership	5.6	4.8	3.7	7.4	5.3	5.3
Technical assistance	23.4	22.6	7.4	14.8	20.5	21.2
Key turn plant	8.9	9.7	7.4	7.4	8.6	9.3
Capital goods	17.7	12.9	7.4	3.7	15.9	11.3
Software	23.4	12.9	3.7	7.4	19.9	11.9
Others	3.2	2.4	3.7	0.0	3.3	2.0

Source: Own elaboration
SF: Transfer from technology to Spanish Firms
FF: Transfer from technology to Foreign Firms

TABLE 11 VALUATION OF THE PROCEDURES OF APPROPRIATION OF THE TECHNOLOGICAL KNOWLEDGE

	NATIONAL CONTROL		FOREIGN CONTROL		TOTAL	
PROCEDURES	Firm	IE	Firm	IE	Firm	IE
Patents	50.0	0.41	63.0	0.63	52.3	0.45
Models of utility	42.0	0.24	44.5	0.26	42.4	0.25
Industrial secrets	58.1	0.51	70.4	0.59	60.3	0.52
Innovative regularity	82.3	1.36	81.5	1.30	82.1	1.35

Source: Own elaboration
Firm: % of the firms that are using each modality.
IE: Indicator of Evaluation (like the formula in table 7).